REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of May 13, 2008 is respectfully requested.

In order to make necessary editorial corrections, the entire specification and abstract have been reviewed and revised. As the revisions are quite extensive, the amendments to the specification and abstract have been incorporated into the attached substitute specification and abstract. For the Examiner's benefit, a marked-up copy of the specification indicating the changes made thereto is also enclosed. No new matter has been added by the revisions. Entry of the substitute specification is thus respectfully requested.

In items 2 and 3 spanning pages 2 and 3 of the Office Action, the Examiner set forth various formal rejections and objections of original claims 1-12. In particular, the Examiner cited several examples of language that rendered the scope of the original claims uncertain. However, as indicated above, the original claims have now been cancelled and replaced with new claims 13-26, including new independent claim 13. All of the new claims have been drafted so as to address the specific examples raised by the Examiner, and so as to place the original claims in a preferred form and sequence. It is respectfully submitted that the Examiner's formal objections and rejections of the original claims are not applicable to new claims 13-26.

The Examiner rejected original claims 1-12 as being unpatentable over the American Welding Society (AWS) publication "Thermal Spraying: Practice, Theory, and Application" (hereinafter, the AWS publication) in view of the Browning reference (USP 4,762,977), the Kang reference (USP 4,788,077) and either the Maros reference (USP 3,052,590) or the Tenkula reference (USP 5,123,152). However, these prior art rejections are respectfully traversed. For the reasons discussed below, it is submitted that new claims 13-26 are clearly patentable over the prior art of record.

As explained in paragraph [0008] of the original specification, conventional techniques of applying a corrosion-prevention coating to a metal body include a blast treatment for preparing the surface of the metal body for the coating to improve adhesion. However, the blast treatment requires a large apparatus and creates a large amount of dust, and so this blast treatment is not

practical for field repair (see paragraph [0009] of the specification). Thus, the present invention is directed to a thermal spraying method for applying a corrosion-prevention spray coating which can be used during field repair, but which also provides similar adhesion effects to blast treatment.

Specifically, the present invention is directed to a thermal spraying method as recited in new independent claim 13. The thermal spraying method comprises roughening a surface of the metal body by using a grinding tool to achieve an average roughness in a range of 2 μm to 10 μm. In addition, thermal spraying is performed in a manner such that *the average total area of each molten particle of the metal thermal spray material* when the molten particles have stuck to the surface of the metal body *is 10,000 μm^2 to 100,000 μm^2* to thereby form the spray coating.

Conventionally, the particle size during thermal spraying is decreased to an extremely small size in order to provide dense coating with less porosity (see, for example, column 9, lines 30-34 of the Kang reference, which teaches an average particle diameter of 25 microns corresponding to an average total area of approximately 500 μm^2). The present Inventor determined that when these small particles contact a metal body (i.e., the thermal spray subject), the small particles quickly lose their heat to the metal body. In other words, the small particles are rapidly cooled and hardened as the metal body absorbs the heat from the small particles.

In contrast to established practices of using extremely small particle sizes, the present Inventor determined that larger particle sizes will eventually result in the temperature of the particles and the temperature of the metal body becoming the same, which, in turn, results in a significant increase in the adhesion strength of the spray coating. More particularly, the Inventor determined that when each molten particle of the thermal spray material has an average total area in a range of 10,000 μm^2 (square microns) to 100,000 μm^2 (square microns), the temperature of the surface of the metal body (thermal spray subject) increases to a point where it is roughly equal to the temperature of the particle, and the adhesion strength of the spray coating is greatly increased (see page 11, lines 15-19 and page 12, lines 11-15 of the original specification). In contrast, if the average area of each molten particle is smaller or larger than the specified range, the Inventor determined that sufficient adhesion strength of the spray coating cannot be obtained

when performing the thermal spraying on a surface roughened using a grinding tool (see page 12, lines 15-18 of the original specification). Consequently, the present invention provides a thermal spraying method which is appropriate for field use (i.e., does not require a large apparatus or generate excessive dust), but still achieves sufficient adhesion between the spray coating and the metal body.

In the outstanding Office Action, the Examiner acknowledged that the AWS publication does not teach or even suggest plasma spraying with wire to achieve the coating with the claimed average area of molten particles as in the present invention. However, the Examiner applied the Browning reference and the Kang reference as apparently teaching (or at least suggesting) the claimed range for the average total area of each molten particle as recited in the original claims and new independent claim 13. However, the Applicant respectfully disagrees.

The Examiner noted that the Browning reference corresponds to Japanese reference 6-39682 referred to in the specification of the present application. The Examiner further noted that, because the Browning reference teaches a thermal spraying apparatus that corresponds to the apparatus used by the Applicant in the present invention to apply the spray coating, "it is clear that Browning at least provides that the range of area sizes provided by the use of such a plasma spraying apparatus will overlap with that claimed." The Applicant concedes that the apparatus disclosed in the Browning reference *may be capable* of providing molten particles with an average total area as recited in the method of independent claim 13. However, the Applicant strongly disagrees with the Examiner's apparent position that, simply because the device of the Browning reference is *capable of* producing molten particles with the claimed average total area as recited in independent claim 13, that the Browning reference actually teaches such a feature.

In support of the Examiner's position, the Examiner cited *In re King* for the proposition that when a prior art device is the same as a device described in the specification for performing a claimed method, then it can be assumed that the device will inherently perform the claimed process. However, the reasoning in the *King* case assumes that the normal and usual operation of the prior art device would ***necessarily*** perform the claimed method. However, on page 11, lines 5-8 of the original specification, the Applicant explains that the plasma spraying apparatus

(presumably, the same apparatus identified by the Examiner in the Browning reference) is used, and that thermal spraying "is performed ***in such a manner that*** an average area of each of molten particles of the thermal spray material when the molten particles have stuck to the surface of the thermal spray subject is 10,000 to 100,000 μm^2." In other words, the prior art device of the Browning reference does not ***necessarily*** perform the claimed method, and the prior art device may in fact perform a thermal spraying operation in an entirely different manner. The present Inventor has determined a particular way in which the apparatus should be used in order to achieve the desired results discussed above. Thus, it is submitted that the Browning reference, either alone or in combination with the other prior art references, does not even suggest the thermal spraying process as recited in independent claim 13.

The Examiner further asserted that the Kang reference teaches that the skilled worker customarily conducts a series of trials to first determine the process conditions or parameters that optimizes properties in the coating such as adhesion to the coating to the substrate, by adjusting various process parameters. Indeed, column 2, lines 28-42 of the Kang reference describe various parameters that can be modified or adjusted to achieve the desirable results. However, the Kang reference does not teach or even suggest that the *size* (i.e., average total area) of each molten particle will have any effect on the adhesion of the spray coating to the metal body. As is well known, a particular parameter (such as the average total area of the molten particle) must first be recognized as a result-effective variable before the determination of the optimum or workable range of the variable can be characterized as routine experimentation. See *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). In the present case, the prior art of record, including the Kang reference, does not identify the average total area of the molten particle as a result-effective variable. In fact, as noted above, the Kang reference instead simply teaches that each particle in the spraying operation should have an extremely small average particle diameter of approximately 25 microns (μm) which would produce an average total area for each particle of approximately 500 square microns (μm^2), which is well below the claimed range. Such teaching is quite contrary to the present invention. Thus, it is submitted that the Kang reference, either

alone or in combination with the other prior art references, also does not even suggest the thermal spraying process recited in new independent claim 13.

The remaining prior art of record also does not teach or even suggest all of the features recited in the thermal spraying method of new independent claim 13. Therefore, one of ordinary skill in the art would have no reason to obtain the thermal spraying method as recited in new independent claim 13. Accordingly, it is respectfully submitted that new independent claim 13 and the claims that depend therefrom are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicant's undersigned representative.

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